

CLAIMS

1. An information processing apparatus for recording AV streams onto a recording medium comprising:
 - encoding means for generating each of said AV streams forming a plurality of reproduction paths;
 - managing information generating means for generating managing information including map information indicating positions of entry points of each of said AV streams and reproduction managing information indicating reproduction path change points set on the basis of said entry points included in said map information; and
 - recording means for recording said AV streams and said managing information onto said recording medium.
2. An information processing apparatus as claimed in claim 1, wherein said managing information generating means generates a correspondence table describing correspondences between packet numbers and presentation time stamps of said entry points as said map information.
3. An information processing apparatus as claimed in claim 2, wherein:
 - said encoding means generates the AV streams one for each of said reproduction paths; and
 - said managing information generating means generates said map information and said reproduction

managing information regarding all the AV streams generated one for each of said reproduction paths as one correspondence table.

4. An information processing apparatus as claimed in claim 2, wherein said managing information generating means generates said map information and said reproduction managing information regarding the AV streams generated one for each of said reproduction paths separately for each of said reproduction paths.

5. An information processing apparatus as claimed in claim 4, wherein said managing information generated by said managing information generating means includes information for specifying each of the AV streams generated one for each of the reproduction paths and information for specifying a section where a plurality of said reproduction paths are present.

6. An information processing apparatus as claimed in claim 2, wherein:

said encoding means performs encoding such that a video stream of each section starting at said reproduction path change point is a Closed GOP starting with an I-picture and a first packet is a video packet; and

said AV streams generated by said encoding means

are included in a transport stream.

7. An information processing apparatus as claimed in claim 6, wherein said encoding means sets an identical value as a video packet ID of the transport stream and an identical value as an audio packet ID of the transport stream in all the reproduction paths.

8. An information processing apparatus as claimed in claim 4, further comprising source-packetizing means for source-packetizing said transport stream of each section,

wherein said recording means records said transport stream of each section source-packetized by said source-packetizing means as an AV stream file onto said recording medium.

9. An information processing apparatus as claimed in claim 2, wherein, when recording said AV streams on said recording medium, said recording means records said AV streams after interleaving said AV streams such that said sections of the reproduction paths are in predetermined order.

10. An information processing apparatus as claimed in claim 2, wherein, when recording said AV streams on said recording medium, said recording means records said AV streams such that a plurality of said sections of an

identical reproduction path are continuous with each other.

11. An information processing apparatus as claimed in claim 2, wherein said reproduction managing information includes change information indicating whether or not reproduction paths can be changed at said entry points.

12. An information processing method of an information processing apparatus for recording AV streams onto a recording medium, said information processing method comprising:

an encoding step of generating each of said AV streams forming a plurality of reproduction paths;

a managing information generating step of generating managing information including map information indicating positions of entry points of each of said AV streams and reproduction managing information indicating reproduction path change points set on the basis of said entry points included in said map information; and

a recording step of recording said AV streams and said managing information onto said recording medium.

13. A program storing medium on which a computer readable program for recording AV streams onto a recording medium is recorded, said program comprising:

an encoding step of generating each of said AV streams forming a plurality of reproduction paths;

a managing information generating step of generating managing information including map information indicating positions of entry points of each of said AV streams and reproduction managing information indicating reproduction path change points set on the basis of said entry points included in said map information; and

a recording step of recording said AV streams and said managing information onto said recording medium.

14. A program for recording AV streams onto a recording medium, said program making a computer perform:

an encoding step of generating each of said AV streams forming a plurality of reproduction paths;

a managing information generating step of generating managing information including map information indicating positions of entry points of each of said AV streams and reproduction managing information indicating reproduction path change points set on the basis of said entry points included in said map information; and

a recording step of recording said AV streams and said managing information onto said recording medium.

15. An information processing apparatus for reproducing AV streams from a recording medium on which

said AV streams, map information for managing an entity of said AV streams, and reproduction managing information for managing reproduction of said AV streams are recordable, said information processing apparatus comprising:

reading means for reading said reproduction managing information given to each reproduction path having each section divided by a reproduction path change point of said AV stream as a unit, and reading said map information including a correspondence table describing a correspondence between a packet number and a presentation time stamp of said change point of said AV stream;

reproducing means for reproducing said AV streams recorded on said recording medium on the basis of said reproduction managing information read by said reading means;

retrieving means for, when an instruction to make a reproduction path change is given, retrieving said reproduction managing information of a reproduction path from which to make the reproduction path change and said reproduction managing information of a reproduction path to which to make the reproduction path change;

first obtaining means for obtaining a reproduction end position of said AV stream of the reproduction path

from which to make the reproduction path change on the basis of said reproduction managing information of the reproduction path from which to make the reproduction path change and said correspondence table of the reproduction path from which to make the reproduction path change;

second obtaining means for obtaining a reproduction start position of said AV stream of the reproduction path to which to make the reproduction path change on the basis of said reproduction managing information of the reproduction path to which to make the reproduction path change and said correspondence table of the reproduction path to which to make the reproduction path change; and

control means for controlling said reproducing means to move a reproducing point at said reproduction end position to said reproduction start position.

16. An information processing method of an information processing apparatus for reproducing AV streams from a recording medium on which said AV streams, map information for managing an entity of said AV streams, and reproduction managing information for managing reproduction of said AV streams are recordable, said information processing method comprising:

a reading step of reading said reproduction

managing information given to each reproduction path having each section divided by a reproduction path change point of said AV stream as a unit, and reading said map information including a correspondence table describing a correspondence between a packet number and a presentation time stamp of said change point of said AV stream;

a reproducing step of reproducing said AV streams recorded on said recording medium on the basis of said reproduction managing information read by processing of said reading step;

a retrieving step of, when an instruction to make a reproduction path change is given, retrieving said reproduction managing information of a reproduction path from which to make the reproduction path change and said reproduction managing information of a reproduction path to which to make the reproduction path change;

a first obtaining step of obtaining a reproduction end position of said AV stream of the reproduction path from which to make the reproduction path change on the basis of said reproduction managing information of the reproduction path from which to make the reproduction path change and said correspondence table of the reproduction path from which to make the reproduction path change;

a second obtaining step of obtaining a reproduction start position of said AV stream of the reproduction path to which to make the reproduction path change on the basis of said reproduction managing information of the reproduction path to which to make the reproduction path change and said correspondence table of the reproduction path to which to make the reproduction path change; and

a control step of controlling processing of said reproducing step to move a reproducing point at said reproduction end position to said reproduction start position.

17. A program storing medium on which a computer readable program is recorded, said program reproducing AV streams from a recording medium on which said AV streams, map information for managing an entity of said AV streams, and reproduction managing information for managing reproduction of said AV streams are recordable, said program comprising:

a reading step of reading said reproduction managing information given to each reproduction path having each section divided by a reproduction path change point of said AV stream as a unit, and reading said map information including a correspondence table describing a correspondence between a packet number and a presentation

time stamp of said change point of said AV stream;

a reproducing step of reproducing said AV streams recorded on said recording medium on the basis of said reproduction managing information read by processing of said reading step;

a retrieving step of, when an instruction to make a reproduction path change is given, retrieving said reproduction managing information of a reproduction path from which to make the reproduction path change and said reproduction managing information of a reproduction path to which to make the reproduction path change;

a first obtaining step of obtaining a reproduction end position of said AV stream of the reproduction path from which to make the reproduction path change on the basis of said reproduction managing information of the reproduction path from which to make the reproduction path change and said correspondence table of the reproduction path from which to make the reproduction path change;

a second obtaining step of obtaining a reproduction start position of said AV stream of the reproduction path to which to make the reproduction path change on the basis of said reproduction managing information of the reproduction path to which to make the reproduction path

change and said correspondence table of the reproduction path to which to make the reproduction path change; and

a control step of controlling processing of said reproducing step to move a reproducing point at said reproduction end position to said reproduction start position.

18. A program for reproducing AV streams from a recording medium on which said AV streams, map information for managing an entity of said AV streams, and reproduction managing information for managing reproduction of said AV streams are recordable, said program making a computer perform:

a reading step of reading said reproduction managing information given to each reproduction path having each section divided by a reproduction path change point of said AV stream as a unit, and reading said map information including a correspondence table describing a correspondence between a packet number and a presentation time stamp of said change point of said AV stream;

a reproducing step of reproducing said AV streams recorded on said recording medium on the basis of said reproduction managing information read by processing of said reading step;

a retrieving step of, when an instruction to make a

reproduction path change is given, retrieving said reproduction managing information of a reproduction path from which to make the reproduction path change and said reproduction managing information of a reproduction path to which to make the reproduction path change;

a first obtaining step of obtaining a reproduction end position of said AV stream of the reproduction path from which to make the reproduction path change on the basis of said reproduction managing information of the reproduction path from which to make the reproduction path change and said correspondence table of the reproduction path from which to make the reproduction path change;

a second obtaining step of obtaining a reproduction start position of said AV stream of the reproduction path to which to make the reproduction path change on the basis of said reproduction managing information of the reproduction path to which to make the reproduction path change and said correspondence table of the reproduction path to which to make the reproduction path change; and

a control step of controlling processing of said reproducing step to move a reproducing point at said reproduction end position to said reproduction start position.

19. An information processing apparatus for recording AV streams onto a recording medium comprising:

encoding means for generating each of said AV streams forming a plurality of reproduction paths;

managing information generating means for generating managing information including map information indicating a start point of said AV stream of each reproduction path and positions of entry points of said AV stream, and reproduction managing information including the start point and an end point of said AV stream, reproduction path change points included in said entry points included in said map information, and specifying information for specifying the AV stream of each reproduction path; and

recording means for recording said AV streams and said managing information onto said recording medium.

20. An information processing apparatus as claimed in claim 19, wherein said managing information generating means generates a correspondence table describing correspondences between packet numbers and presentation time stamps of said entry points as said map information.

21. An information processing apparatus as claimed in claim 20, wherein:

said encoding means generates the AV streams one

for each of said reproduction paths; and

said managing information generating means generates said map information and said reproduction managing information regarding all the AV streams generated one for each of said reproduction paths as one correspondence table.

22. An information processing apparatus as claimed in claim 20, wherein said managing information generating means generates said map information and said reproduction managing information regarding the AV streams generated one for each of said reproduction paths separately for each of said reproduction paths.

23. An information processing apparatus as claimed in claim 22, wherein said managing information generated by said managing information generating means includes information for specifying each of the AV streams generated one for each of the reproduction paths and information for specifying a section where a plurality of said reproduction paths are present.

24. An information processing apparatus as claimed in claim 20, wherein:

said encoding means performs encoding such that a video stream of each section starting at said reproduction path change point is a Closed GOP starting

with an I-picture and a first packet is a video packet;
and

said AV streams generated by said encoding means
are included in a transport stream.

25. An information processing apparatus as claimed
in claim 24, wherein said encoding means performs
encoding such that a start of the video stream of each
section is said Closed GOP and a subsequent part of the
video stream of each section is a non-Closed GOP.

26. An information processing apparatus as claimed
in claim 22, further comprising source-packetizing means
for source-packetizing said transport stream of each
section,

wherein said recording means records said transport
stream of each section source-packetized by said source-
packetizing means as an AV stream file onto said
recording medium.

27. An information processing apparatus as claimed
in claim 26, wherein said managing information generating
means generates one said correspondence table to be
included in said map information, said correspondence
table corresponding to said AV stream file.

28. An information processing apparatus as claimed
in claim 20, wherein, when recording said AV streams on

said recording medium, said recording means records said AV streams after interleaving said AV streams such that said sections of the reproduction paths are in predetermined order.

29. An information processing apparatus as claimed in claim 20, wherein, when recording said AV streams on said recording medium, said recording means records said AV streams such that a plurality of said sections of an identical reproduction path are continuous with each other.

30. An information processing apparatus as claimed in claim 19, wherein said reproduction managing information includes change information indicating whether or not reproduction paths can be changed at said entry points.

31. An information processing method of an information processing apparatus for recording AV streams onto a recording medium, said information processing method comprising:

an encoding step of generating each of said AV streams forming a plurality of reproduction paths;

a managing information generating step of generating managing information including map information indicating a start point of said AV stream of each

reproduction path and positions of entry points of said AV stream, and reproduction managing information including the start point and an end point of said AV stream, reproduction path change points included in said entry points included in said map information, and specifying information for specifying the AV stream of each reproduction path; and

a recording step of recording said AV streams and said managing information onto said recording medium.

32. A program storing medium on which a computer readable program of an information processing apparatus for recording AV streams onto a recording medium is recorded, said program comprising:

an encoding step of generating each of said AV streams forming a plurality of reproduction paths;

a managing information generating step of generating managing information including map information indicating a start point of said AV stream of each reproduction path and positions of entry points of said AV stream, and reproduction managing information including the start point and an end point of said AV stream, reproduction path change points included in said entry points included in said map information, and specifying information for specifying the AV stream of

each reproduction path; and

a recording step of recording said AV streams and said managing information onto said recording medium.

33. A program of an information processing apparatus for recording AV streams onto a recording medium, said program making a computer perform:

an encoding step of generating each of said AV streams forming a plurality of reproduction paths;

a managing information generating step of generating managing information including map information indicating a start point of said AV stream of each reproduction path and positions of entry points of said AV stream, and reproduction managing information including the start point and an end point of said AV stream, reproduction path change points included in said entry points included in said map information, and specifying information for specifying the AV stream of each reproduction path; and

a recording step of recording said AV streams and said managing information onto said recording medium.

34. An information processing apparatus for reproducing AV streams from a recording medium on which said AV streams, map information for managing an entity of said AV streams, and reproduction managing information

for managing reproduction of said AV streams are recordable, said information processing apparatus comprising:

reading means for reading said reproduction managing information including a reproduction path change point of said AV streams, a start point and an end point of said AV streams, and specifying information for specifying the AV stream of each reproduction path, and reading said map information including a correspondence table describing correspondences between packet numbers and presentation time stamps of said start point and said change point of said AV streams;

reproducing means for reproducing said AV streams recorded on said recording medium on the basis of said reproduction managing information read by said reading means;

retrieving means for, when an instruction to make a reproduction path change is given, retrieving said section of a reproduction path from which to make the reproduction path change and said section of a reproduction path to which to make the reproduction path change;

first obtaining means for obtaining a reproduction end position of said AV stream of the reproduction path

from which to make the reproduction path change on the basis of said section of the reproduction path from which to make the reproduction path change and said correspondence table of the reproduction path from which to make the reproduction path change;

second obtaining means for obtaining a reproduction start position of said AV stream of the reproduction path to which to make the reproduction path change on the basis of said section of the reproduction path to which to make the reproduction path change and said correspondence table of the reproduction path to which to make the reproduction path change; and

control means for controlling said reproducing means to move a reproducing point at said reproduction end position to said reproduction start position.

35. An information processing method of an information processing apparatus for reproducing AV streams from a recording medium on which said AV streams, map information for managing an entity of said AV streams, and reproduction managing information for managing reproduction of said AV streams are recordable, said information processing method comprising:

a reading step of reading said reproduction managing information including a reproduction path change

point of said AV streams, a start point and an end point of said AV streams, and specifying information for specifying the AV stream of each reproduction path, and reading said map information including a correspondence table describing correspondences between packet numbers and presentation time stamps of said start point and said change point of said AV streams;

a reproducing step of reproducing said AV streams recorded on said recording medium on the basis of said reproduction managing information read by processing of said reading step;

a retrieving step of, when an instruction to make a reproduction path change is given, retrieving said section of a reproduction path from which to make the reproduction path change and said section of a reproduction path to which to make the reproduction path change;

a first obtaining step of obtaining a reproduction end position of said AV stream of the reproduction path from which to make the reproduction path change on the basis of said section of the reproduction path from which to make the reproduction path change and said correspondence table of the reproduction path from which to make the reproduction path change;

a second obtaining step of obtaining a reproduction start position of said AV stream of the reproduction path to which to make the reproduction path change on the basis of said section of the reproduction path to which to make the reproduction path change and said correspondence table of the reproduction path to which to make the reproduction path change; and

a control step of controlling processing of said reproducing step to move a reproducing point at said reproduction end position to said reproduction start position.

36. A program storing medium on which a computer readable program is recorded, said program reproducing AV streams from a recording medium on which said AV streams, map information for managing an entity of said AV streams, and reproduction managing information for managing reproduction of said AV streams are recordable, said program comprising:

a reading step of reading said reproduction managing information including a reproduction path change point of said AV streams, a start point and an end point of said AV streams, and specifying information for specifying the AV stream of each reproduction path, and reading said map information including a correspondence

table describing correspondences between packet numbers and presentation time stamps of said start point and said change point of said AV streams;

a reproducing step of reproducing said AV streams recorded on said recording medium on the basis of said reproduction managing information read by processing of said reading step;

a retrieving step of, when an instruction to make a reproduction path change is given, retrieving said section of a reproduction path from which to make the reproduction path change and said section of a reproduction path to which to make the reproduction path change;

a first obtaining step of obtaining a reproduction end position of said AV stream of the reproduction path from which to make the reproduction path change on the basis of said section of the reproduction path from which to make the reproduction path change and said correspondence table of the reproduction path from which to make the reproduction path change;

a second obtaining step of obtaining a reproduction start position of said AV stream of the reproduction path to which to make the reproduction path change on the basis of said section of the reproduction path to which

to make the reproduction path change and said correspondence table of the reproduction path to which to make the reproduction path change; and

a control step of controlling processing of said reproducing step to move a reproducing point at said reproduction end position to said reproduction start position.

37. A program for reproducing AV streams from a recording medium on which said AV streams, map information for managing an entity of said AV streams, and reproduction managing information for managing reproduction of said AV streams are recordable, said program making a computer perform:

a reading step of reading said reproduction managing information including a reproduction path change point of said AV streams, a start point and an end point of said AV streams, and specifying information for specifying the AV stream of each reproduction path, and reading said map information including a correspondence table describing correspondences between packet numbers and presentation time stamps of said start point and said change point of said AV streams;

a reproducing step of reproducing said AV streams recorded on said recording medium on the basis of said

reproduction managing information read by processing of said reading step;

a retrieving step of, when an instruction to make a reproduction path change is given, retrieving said section of a reproduction path from which to make the reproduction path change and said section of a reproduction path to which to make the reproduction path change;

a first obtaining step of obtaining a reproduction end position of said AV stream of the reproduction path from which to make the reproduction path change on the basis of said section of the reproduction path from which to make the reproduction path change and said correspondence table of the reproduction path from which to make the reproduction path change;

a second obtaining step of obtaining a reproduction start position of said AV stream of the reproduction path to which to make the reproduction path change on the basis of said section of the reproduction path to which to make the reproduction path change and said correspondence table of the reproduction path to which to make the reproduction path change; and

a control step of controlling processing of said reproducing step to move a reproducing point at said

reproduction end position to said reproduction start position.

38. A computer readable recording medium on which AV streams, map information for managing an entity of said AV streams, and reproduction managing information for managing reproduction of said AV streams are recordable,

wherein data is recorded having a structure such that:

said reproduction managing information includes information on a reproduction path change point of said AV streams and a start point and an end point of said AV streams; and

said map information includes a correspondence table describing correspondences between packet numbers and presentation time stamps of said start point and said change point of said AV streams.

39. A computer readable recording medium on which AV streams, map information for managing an entity of said AV streams, and reproduction managing information for managing reproduction of said AV streams are recordable,

wherein data is recorded having a structure such that:

said reproduction managing information includes a reproduction path change point of said AV streams, a start point and an end point of said AV streams, and specifying information for specifying the AV stream of each reproduction path; and

said map information includes a correspondence table describing correspondences between packet numbers and presentation time stamps of said start point and said change point of said AV streams.